

has altered our notions concerning the prevailing deep-rootedness of desert plants. In a recent short paper he brings further data along similar lines. The mesquite, as is well known, either may be a shrub or it may be a tree of considerable size. On flood plains, where it is a tree, its roots penetrate to the water table, whose depth may be 15-25 feet. Shrubby specimens on higher grounds have extensively spreading rather than deep roots. CANNON considers the root situation in different types of climate and makes several interesting suggestions.

In a brief note³⁹ CANNON calls attention to the somewhat curious fact that at Carmel, California, the removal of the chaparral undergrowth in forests of *Pinus radiata* is followed by the death of the pines. This is attributed to the shallow root system of the pines, which comes to grief when the soil is desiccated as a result of the removal of the chaparral.—H. C. COWLES.

Sand hill forestation.—Some government experiments of considerable interest to ecologists are being conducted in the sand hills of Kansas and Nebraska, as noted by BATES and PIERCE.⁴⁰ While the sand hills of Kansas are not extensive, almost a fourth of Nebraska is thus classified. Trees and even shrubs are not naturally very abundant in the sand hill region except along streams. In the planting a cue is taken from nature in the presence of *Pinus ponderosa* in the sand hill region; the occurrence of isolated tracts of this species suggests a former more extensive distribution. At the suggestion of Professor BESSEY, the Forest Service began planting as far back as 1891. About ten years ago, large tracts of land capable of forestation were set aside as national forests, and nurseries were established at Halsey, Nebraska, and Garden City, Kansas. In the Nebraska nursery, attention has been paid to conifers, and success has been had especially with *Pinus Banksiana* and the native *P. ponderosa*. In the Kansas nursery, experiment has been made chiefly with hardwoods.—H. C. COWLES.

The chemistry of symbiosis.—Not much is known concerning the exact chemical interrelations of symbionts. To ZELLNER it is a matter of surprise that investigators of symbiosis have paid so little attention to this fundamentally important feature, and he indicates in a brief paper⁴¹ some of the places where more knowledge is urgently needed. Best known, of course, are the chemical interrelations existing between bacteria and Leguminosae. The significance of mycorrhiza is much in dispute; ZELLNER's view is that the fungi are water-absorbing organs for the roots. In the endotrophic forms phago-

³⁹ CANNON, W. A., A note on a chaparral-forest relation at Carmel, California. *Plant World* 16:36-38. 1913.

⁴⁰ BATES, C. G., and PIERCE, R. G., Forestation of the sand hills of Nebraska and Kansas. *Bull.* 121, U.S. Forest Service. pp. 49. *pls.* 13. *fig.* 1. 1913.

⁴¹ ZELLNER, JULIUS, Die Symbiose der Pflanzen als chemisches Problem. *Beih. Bot. Centralbl.* 28¹: 473-486. 1912.